nutrex NV

the finishing touch for nutrition

Nutrase P

6-Phytase

BETTER P AVAILABILITY, LOWER COST, LESS POLLUTION

Phosphorous

BIOLOGICAL

Phosphorous is a key element in all known forms of life. Inorganic phosphorous, as phosphate (PO_4^{3-}), plays a major role in biological molecules such as DNA and RNA, where it is part of the structural framework of these molecules.

Living cells also use phosphate to transport cellular energy as adenosine triphosphate (ATP). Nearly every cellular process that uses energy obtains it as ATP. ATP is also important for phosphorylation, a key regulatory event in cells.

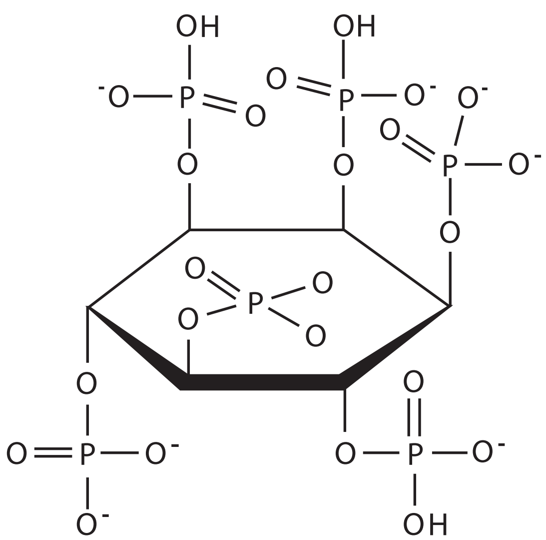
Phospholipids are the main structural components of all cellular membranes. Calcium phospate salts assist in stiffening bones.

Phytic acid (known as inosital 6-phosphate (IP6), or phytate when in salt form) is the principal storage form of phosphorous in many plant tissues, especially in bran and seeds.

TABLE 1: P-LEVELS IN RAW MATERIALS

	TP (%)	PHYTATE-P (%)
INORGANIC P		
MCP	22,6	-
DCP	18,2	-
ORGANIC P		
Corn	0,28	0,19
Corn gluten meal	0,47	0,32
Wheat	0,32	0,21
Wheat middlings	1,06	0,90
Barley	0,35	0,24
SBM 46	0,64	0,45
Sorghum	0,28	0,19
Rice Bran	1,45	1,31

FIGURE 1: PHYTATE



PHYTATE

Phosphorous in phytate is, in general, not bioavailable to non-ruminant animals, because they lack the digestive enzyme phytase, wich is required to separate phosphorous from the phytate molecule.

Because diets of monogastrics are high in phytate-P, the undigested P can elevate the phosporous levels in the manure. In areas with intensive livestock production, this can lead to environmental problems such as eutrophication.

Furtermore, phytic acid is a strong chelator of important minerals such as calcium, magnesium, iron and zinc and in this way it can be considered as an anti-nutritional factor.

Nutrase P

EFFECTS OF PHYTASE

Nutrase P is a bacterial 6-phytase preparation that releases phosphate ($H_2PO_4^-$) bound to phytic acid in vegetable materials, in order to partly replace inorganic phospate in animal feed.

USE OF NUTRASE P

Nutrase P releases phosphate from phytate and increases the availability of a whole range of nutrients:

Macro -minerals

- Phosphorous (P)
  In 1 kg feed, 100 mg Nutrase P replaces:
  1,20 g total P from monocalciumphosphate
  1,38 g total P from dicalciumphosphate
  1,50 g total P from bone meal
- Calcium

Trace minerals

- e.g. zinc, iron, magnesium & copper

Amino acids and proteins

TABLE 3: BROILER TRIAL (UNIVERSITY OF LEUVEN • BELGIUM • 2005)

	Pos. control	Nutrase
Basic feed	Corn based	
Monocalciumphosphate	0,8 %	0,37 %
Nutrase P	-	100 ppm
Body weight (day 42)	2120 g	2112 g
Feed conversion	1,72	1,70
Feed conversion (2kg)	1,67	1,65
Conclusion: Nutrase P can replace MCP as a P source		

TABLE 2: MATRIX VALUES OF NUTRASE P

%	Broilers & Turkeys	Laying hens	Pigs
Moisture	8	8	
Dig. P poultry	1200	2000	-
Dig. P pigs	-	-	1000
Calcium	1250	2083	1250
Dig. Lysine	150	150	100
Dig. Methionine	15	15	30
Dig. Threonine	130	130	50
Dig. Thryptophan	30	30	30

ADVANTAGES

Feed enzymes encounter a series of different "working" environments during their application. Firstly, feed production processes result in high temperatures, humidity, ... Secondly, the gastro-intestinal tract puts a strain on enzyme activity: pH, proteolytic enzymes, temperature, ... It is well known that the origin of feed enzymes (bacterial or fungal) greatly determines their properties such thermal stability (Fig 2), resistance to protease inactivation (pancratic proteases, Table 4), optimal pH, release pattern of P (Fig 3,4),...

RESULTS WITH NUTRASE P

FIGURE 2: THERMAL STABILITY - PELLETISATION TRIAL

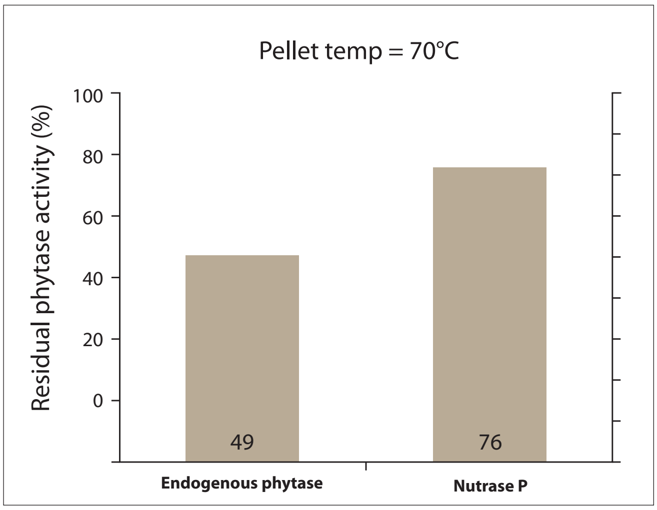


TABLE 4: RESIDUAL PHYTASE ACTIVITY (%) AFTER INCUBATION IN DIGESTA SUPERNATANT (60 MINUTES AT 40°C)

	Crop	Stomach	Doudenum	Jejunum	Ileum
6-phytase (E. coli)	96,9	92,8	96,8	86,7	80,4
3-phytase (Aspergillus)	98,5	60,4	93,6	60,2	54,5

FIGURE 3: RELEASE OF P FROM INOSITOL-6P
6-PHYTASE (E.COLI) VERSUS 3-PHYTASE (ASPERGILLUS)

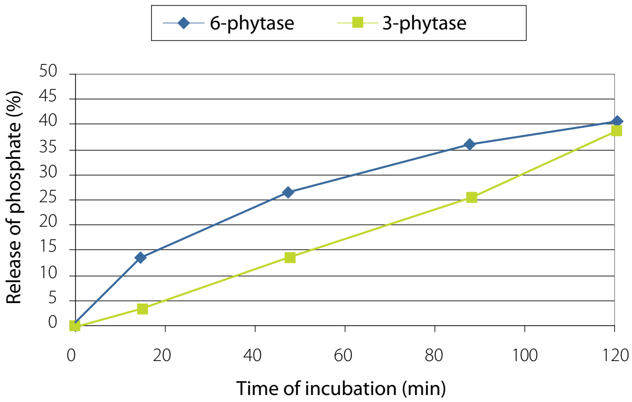


FIGURE 4: DISAPPEARANCE RATE OF INOSITOL-6P
6-PHYTASE (E.COLI) VERSUS 3-PHYTASE (ASPERGILLUS)